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EXAMINER	
YOUNG, NATASHA E	

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1797	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/528,435	MAK, JOHN	
	Examiner	Art Unit	
	NATASHA YOUNG	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _09 June 2009_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-7 and 9-20_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-7 and 9-20_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 9, 2009 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

2. Claims 1-3, 5, 7, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554) in view of Finn et al (US

6,363,744 B2) and Lee et al (US 6,354,105 B1).

Regarding claim 1, Vijayaraghavan et al discloses a natural gas liquid plant, comprising: a separator (6) that is configured to allow separation of a cooled low pressure feed gas (1) into a liquid portion and a vapor portion, and a first pressure reduction device (24) that is configured to receive the liquid portion and to allow reduction of pressure of the liquid portion to provide refrigeration for a first cooler (8) that is fluidly coupled to the separator and that is configured to allow cooling of a low pressure feed gas to thereby allow formation of the cooled low pressure feed gas; a second pressure reduction device (20); and a demethanizer (36) (see column 3, line 7 through column 4, line 58 and figure 1).

Vijayaraghavan et al does not disclose a cooled low pressure feed gas having a feed gas pressure of at or below 1100 psig.

Finn et al discloses a cooled low pressure feed gas (2) having a feed gas pressure of at or below 1100 psig (see Table 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a cooled low pressure feed gas having a feed gas pressure of at or below 1100 psig, since gaseous hydrocarbon feeds may have a pressure of at or below 1100 psig, as taught by Finn et al and since it has been held that where the general conditions of claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 (II-A)).

Vijayaraghavan et al does not disclose a second cooler and a second pressure reduction device fluidly coupled to the separator, wherein the second cooler is

configured to allow cooling of at least part of the vapor portion, and wherein the second pressure reduction device is configured to reduce pressure of the part of the vapor portion to a degree effective to provide the part of the vapor portion to an absorber as lean absorber reflux; and wherein the absorber is configured to produce an absorber overhead product to thereby provide refrigeration for the second cooler, and wherein the absorber is further configured to produce an absorber bottoms product, and a demethanizer fluidly coupled to the absorber and configured to receive the absorber bottoms product as lean reflux.

Lee et al discloses a natural gas liquid plant, comprising: a separator (34a) that is configured to allow separation of a cooled low pressure feed gas at about feed gas pressure into a liquid portion and a vapor portion, and a first pressure reduction device (see figure 4) that is configured to receive the liquid portion and to allow reduction of pressure of the liquid portion; a second cooler (26) and a second pressure reduction device (see figure 4) fluidly coupled to the separator (34a), wherein the second cooler (26) is configured to allow cooling of at least part of the vapor portion, and wherein the second pressure reduction device is configured to reduce pressure of the part of the vapor portion to a degree effective to provide the part of the vapor portion to an absorber (28a) as lean absorber reflux; and wherein the absorber is configured to produce an absorber overhead product to thereby provide refrigeration for the second cooler (26), and wherein the absorber (28a) is further configured to produce an absorber bottoms product, and a demethanizer (28) fluidly coupled to the absorber and configured to receive the absorber bottoms product as lean reflux (see figure 4 and

column 9, line 35 through column 10, line 14).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Vijayaraghavan et al and Finn et al with the teachings of Lee et al such that a NGL plant comprises a second cooler and a second pressure reduction device fluidly coupled to the separator, wherein the second cooler is configured to allow cooling of at least part of the vapor portion, and wherein the second pressure reduction device is configured to reduce pressure of the part of the vapor portion to a degree effective to provide the part of the vapor portion to an absorber as lean absorber reflux; and wherein the absorber is configured to produce an absorber overhead product to thereby provide refrigeration for the second cooler, and wherein the absorber is further configured to produce an absorber bottoms product, and a demethanizer fluidly coupled to the absorber and configured to receive the absorber bottoms product as lean reflux in order to provide addition refrigeration devices (see Vijayaraghavan et al column 7, lines 34-58) since the cooler (26) and absorber (38a) provide additional refrigeration (see Lee et al column 6, lines 43-56 and column 9, lines 51-64).

Regarding claim 2, Vijayaraghavan et al disclose a NGL plant wherein the low pressure feed gas has a pressure of about 300 psig to about 700 psig (see column 4, lines 13-19).

Regarding claim 3, Vijayaraghavan et al discloses a NGL plant further comprising a plurality of side reboilers (12, 14) that are thermally coupled to the demethanizer (36) and that are configured to cool a portion of the low pressure feed gas (3) (see figure 1

and column 7, lines 17-34)..

Regarding claim 5, Vijayaraghavan et al does not disclose a NGL plant wherein the demethanizer is configured to receive the liquid portion that is reduced in pressure as a demethanizer feed stream.

Lee et al discloses a NGL plant wherein the demethanizer (28) is configured to receive the liquid portion (38a) that is reduced in pressure, by a pressure reduction device (see figure 4), as a demethanizer feed stream (see column 8, line 56 through column 9, line 3 and figure 4).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to configure the demethanizer in the modified apparatus of Vijayaraghavan et al to receive the liquid portion that is reduced in pressure because this arrangement would be recommended when the feed gas contains heavier constituents, such as aromatic compounds, which could potentially freeze up in the reflux condenser at cryogenic temperatures as taught by Lee et al (see column 8, line 56 through column 9, line 3).

Regarding claim 7, the recitations with respect to ethane recovery and propane recovery are considered process limitations which do not impart further patentable weight to the apparatus claims.

Regarding claim 16, Vijayaraghavan et al discloses a natural gas liquid plant that comprises a separator (6) that is configured to receive a cooled low pressure feed gas (1) at about feed gas pressure and that is fluidly coupled to a demethanizer (36), wherein the plant is further configured such that refrigeration duty of the demethanizer is

provided at least in part by expansion of a liquid portion of the cooled low pressure feed gas from the feed gas pressure (12, 14) and an expansion of a vapor portion from the feed gas pressure using a device (20) other than a turboexpander, and wherein the demethanizer is configured to receive the expanded liquid portion as demethanizer feed (see column 3, line 7 through column 4, line 58; column 7, lines 17-34; and figure 1).

Vijayaraghavan et al does not disclose a cooled low pressure feed gas having a feed gas pressure of at or below 1100 psig.

Finn et al discloses a cooled low pressure feed gas (2) having a feed gas pressure of at or below 1100 psig (see Table 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a cooled low pressure feed gas having a feed gas pressure of at or below 1100 psig, since gaseous hydrocarbon feeds may have a pressure of at or below 1100 psig, as taught by Finn et al and since it has been held that where the general conditions of claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 (II-A)).

Vijayaraghavan et al does not disclose a separator that is fluidly coupled to an absorber and a demethanizer, wherein the plant is further configured such that refrigeration duty of the absorber and demethanizer are provided at least in part by expansion of a liquid portion of the cooled low pressure feed gas from the feed gas pressure and an expansion of a vapor portion from the feed gas pressure using a device other than a turboexpander.

Lee et al discloses a separator (34a) that is fluidly coupled to an absorber (28a)

and a demethanizer (28), wherein the plant is further configured such that refrigeration duty of the absorber (28a) and demethanizer (28) are provided at least in part by expansion of a liquid portion of the cooled low pressure feed gas from the feed gas pressure (120, 80) and an expansion of a vapor portion from the feed gas pressure using a device (100) other than a turboexpander (see figure 4; column 5, line 50 through column 6, line 42; column 9, line 51 through column 10, line 14).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Vijayaraghavan et al and Finn et al with the teachings of Lee et al such that a NGL plant comprises a separator that is fluidly coupled to an absorber and a demethanizer, wherein the plant is further configured such that refrigeration duty of the absorber and demethanizer are provided at least in part by expansion of a liquid portion of the cooled low pressure feed gas from the feed gas pressure and an expansion of a vapor portion from the feed gas pressure using a device other than a turboexpander in order to provide addition refrigeration devices (see Vijayaraghavan et al column 7, lines 34-58), since the absorber (38a) provides additional refrigeration (see Lee et al column 6, lines 43-56 and column 9, lines 51-64).

Regarding claim 17, Vijayaraghavan et al discloses a NGL plant further comprising a cooler (8) that is configured to further cool the cooled low pressure feed gas using an expanded liquid portion of the cooled low pressure feed gas as a refrigerant (see figure 1 and column 4, line 59 through column 5, line 7).

Regarding claim 18, Vijayaraghavan et al does not disclose a NGL plant wherein the absorber is configured to produce an absorber bottom product that is fed to the

demethanizer as reflux.

Lee et al discloses a NGL plant wherein the absorber is configured to produce an absorber bottom product that is fed to the demethanizer as reflux (see figure 4 and column 9, lines 51-64).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Vijayaraghavan et al with the teachings of Lee et al such that a NGL plant wherein the absorber is configured to produce an absorber bottom product that is fed to the demethanizer as reflux in order to provide addition refrigeration devices (see Vijayaraghavan et al column 7, lines 34-58) since the absorber (38a) provides additional refrigeration (see Lee et al column 6, lines 43-56 and column 9, lines 51-64).

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554), Finn et al (US 6,363,744 B2), and Lee et al (US 6,354,105 B1) as applied to claim 1 above, and further in view of Hoffart et al (US 6,295,833 B1) and Campbell et al (US 5,771,712).

Regarding claim 4, Vijayaraghavan et al does not discloses a NGL plant wherein the first pressure reduction device comprises a hydraulic turbine, and wherein the second pressure reduction device comprises a Joule-Thomson valve.

However, Vijayaraghavan et al discloses a controlled expansion valve (24) as the first pressure reduction device (see figure 1 and column 4, line 59 through column 5, line 7) and an expander (20) as the second reduction device (see figure 1, lines 35-58).

Hoffart et al discloses that expander (56) may be an expansion valve, hydraulic

turbine or other expansion device, or combination thereof (see column 5, lines 52-65).

Therefore, because these two expansion devices were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a hydraulic turbine for a controlled expansion valve.

Additionally, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a hydraulic turbine as the first pressure reduction device, since it was known in the art that a hydraulic turbine is an expansion device (see MPEP 2144.03 (A-E)).

Campbell et al discloses an expansion valve (13) produced the Joule-Thomson effect during expansion (see column 54 through 9) such that the expansion valve is a Joule-Thomson valve.

Therefore, because these two expansion devices were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a Joule-Thomson valve for an expander.

Additionally, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a Joule-Thomson valve as the second pressure reduction device, since it was known in the art that a Joule-Thomson valve is an expansion device (see MPEP 2144.03 (A-E)).

4. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554), Finn et al (US 6,363,744 B2), and Lee et al (US 6,354,105 B1) as applied to claim 1 above, and further in view of Buck (US 4,617,039).

Regarding claim 6, Vijayaraghavan et al does not discloses a NGL plant further

comprising a turboexpander that is configured to allow expansion of part of the vapor portion, and further comprising a second separator that is configured to receive the expanded part of the vapor portion and to produce a liquid that is employed as a lean demethanizer reflux and a vapor that is fed into the absorber.

However, Vijayaraghavan discloses an expander (20), a second separator (30), and a demethanizer (36) (see column 3, line 7 through column 4, line 58 and figure 1).

Lee et al discloses a pressure reduction device, a second separator (34), and a liquid (38a) that is employed as a lean demethanizer reflux and a vapor (44a) that is fed into the absorber (28a) (see figure 4, column 8, line 56 through column 9, line 3; and column 9, line 35 through column 10, line 14).

Buck discloses a first separator (103), a turboexpander (106) that is configured to allow expansion of part of the vapor portion, and further comprising a second separator (107) that is configured to receive the expanded part of the vapor portion and to produce a liquid that is employed as a lean deethanizer reflux and a vapor that is fed into the separator (see figure 1 and column 3, line 43 through column 4, line 40).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to have a in the modified apparatus of Vijayaraghavan et al, because the addition of the absorber would be recommended when the feed gas contains heavier constituents, such as aromatic compounds, which could potentially freeze up in the reflux condenser at cryogenic temperatures as taught by Lee et al (see column 8, line 56 through column 9, line 3) as taught by Lee et al. and because such an arrangement would result in improved separation of lighter components from the

heavier components (see column 4, lines 13-26) as taught by Buck.

5. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554), Finn et al (US 6,363,744 B2), and Lee et al (US 6,354,105 B1) as applied to claim 16 above, and further in view of Campbell et al (US 5,771,712).

Regarding claim 19, Vijayaraghavan et al discloses a NGL plant wherein the separator (6) is configured to separate a vapor portion (16) from the cooled low pressure feed gas (1) and an expander (20) is configured to further cool a first part of the vapor portion (see column 3, line 36 through column 4, line 58 and figure 1).

Vijayaraghavan et al does not disclose wherein a Joule-Thomson valve is configured to further cool a first part of the vapor portion for introduction into the absorber.

Campbell et al discloses an expansion valve (13) produced the Joule-Thomson effect during expansion (see column 54 through 9) such that the expansion valve is a Joule-Thomson valve.

Therefore, because these two expansion devices were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a Joule-Thomson valve for an expander.

Lee et al discloses a valve which is configured to further cool a first part of the vapor portion for introduction into the absorber (28a) (see figure 4 and column 9, lines 43-64).

It would have been obvious to one having ordinary skill in the art at the time the

invention was made to modify the teachings of Vijayaraghavan et al and Campbell et al with the teachings of Lee et al such that a NGL plant wherein a Joule-Thomson valve is configured to further cool a first part of the vapor portion for introduction into the absorber in order to provide addition refrigeration devices (see Vijayaraghavan et al column 7, lines 34-58) since the absorber (38a) provides additional refrigeration (see Lee et al column 6, lines 43-56 and column 9, lines 51-64).

6. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554), Finn et al (US 6,363,744 B2), Lee et al (US 6,354,105 B1), and Campbell et al (US 5,771,712) as applied to claim 19 above, and further in view of Buck (US 4,617,039).

Regarding claim 20, Vijayaraghavan et al does not disclose a NGL plant further comprising a turboexpander that is configured to expand and cool a second part of the vapor portion.

Lee et al discloses an expansion valve (100) that is configured to expand and cool a second part of the vapor portion (see column 6, lines 20-42 and figure 4).

Buck et al discloses a turboexpander (106) used to expansion a vapor portion of a separator (103) (see column 4, lines 3-26 and figure 1).

Therefore, because these two expansion devices were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a turboexpander for an expansion valve.

Additionally, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a turboexpander that is configured to expand

and cool a second part of the vapor portion, since it was known in the art that a turboexpander is an expansion device (see MPEP 2144.03 (A-E)).

7. Claims 9-10, 12-13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554) in view of Finn et al (US 6,363,744 B2), Buck (US 4,617,039), and Lee et al (US 6,354,105 B1).

Regarding claim 9, Vijayaraghavan et al discloses a NGL plant comprising: a primary cooler (8) that is configured to cool a low pressure feed gas, a separator (6) that is configured to separate the cooled low pressure feed gas at about feed gas pressure in a liquid portion and a vapor portion; a first pressure reduction device (24) configured to reduce pressure of the liquid portion to thereby provide refrigeration for the primary cooler; a pressure reduction device that is configured to expand the vapor portion (20); and a demethanizer (36) (see column 3, line 7 through column 4, line 58 and figure 1).

Vijayaraghavan et al does not disclose a cooled low pressure feed gas having a feed gas pressure of at or below 1100 psig.

Finn et al discloses a cooled low pressure feed gas (2) having a feed gas pressure of at or below 1100 psig (see Table 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a cooled low pressure feed gas having a feed gas pressure of at or below 1100 psig, since gaseous hydrocarbon feeds may have a pressure of at or below 1100 psig, as taught by Finn et al and since it has been held that where the general conditions of claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 (II-A)).

Vijayaraghavan et al does not disclose a primary and secondary cooler that are configured to cool a low pressure feed gas, and a first pressure reduction device that is configured to reduce pressure of the liquid portion to thereby provide refrigeration for the secondary cooler; a third cooler that is configured to cool at least part of the vapor portion to form a lean reflux, and a pressure reduction device that is configured to expand the cooled vapor portion; and an absorber that is configured to receive the lean absorber reflux and to produce an overhead product that provides refrigeration for the third cooler and a bottom product that is employed as reflux in a demethanizer.

Buck discloses a primary and secondary cooler (100, 102) that are configured to cool a low pressure feed gas, and a first pressure reduction device (104) that is configured to reduce pressure of the liquid portion to thereby provide refrigeration for the secondary cooler (102) (see figure 1 and column 3, line 43 through column 4, line 51).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a primary and a secondary cooler, since it has been held that mere duplication of the essential working parts of a device involves only ordinary skill in the art (see MPEP 2144.04 (VI-B)).

Lee et al discloses a cooler (26) that is configured to cool at least part of the vapor portion, and a pressure reduction device (see figure 4) that is configured to expand the cooled vapor portion; and an absorber (28a) that is configured to receive the cooled and expanded vapor portion and to produce an overhead product that provides refrigeration for the cooler (26) and a bottom product that is employed as reflux in a

demethanizer (28) (see figure 4 and column 9, line 35 through column 10, line 14).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Vijayaraghavan et al with the teachings of Buck and Lee et al such that a NGL plant comprises a primary and secondary cooler that are configured to cool a low pressure feed gas, and a first pressure reduction device that is configured to reduce pressure of the liquid portion to thereby provide refrigeration for the secondary cooler; a third cooler that is configured to cool at least part of the vapor portion, and a pressure reduction device that is configured to expand the cooled vapor portion to form a lean absorber reflux; and an absorber that is configured to receive the lean absorber reflux and to produce an overhead product that provides refrigeration for the third cooler and a bottom product that is employed as reflux in a demethanizer in order to provide addition refrigeration devices (see Vijayaraghavan et al column 7, lines 34-58) since the coolers (101, 102) of Buck provides additional cooling and the cooler (26) and absorber (38a) provide additional refrigeration (see Lee et al column 6, lines 43-56 and column 9, lines 51-64).

Regarding claim 10, Vijayaraghavan et al disclose a NGL plant wherein the low pressure feed gas has a pressure of about 300 psig to about 700 psig (see column 4, lines 13-19).

Regarding claim 12, Vijayaraghavan et al discloses a NGL plant further comprising a plurality of side reboilers (12, 14) that are thermally coupled to the demethanizer (36) and that are configured to cool a portion of the low pressure feed gas (3) (see figure 1 and column 7, lines 17-34).

Regarding claim 13, Vijayaraghavan et al does not disclose a NGL plant further comprising a turboexpander that is configured to allow expansion of part of the vapor portion, and further comprising a second separator that is configured to receive the expanded part of the vapor portion and to produce a liquid that is employed as a lean demethanizer reflux and a vapor that is fed into the absorber.

However, Vijayaraghavan discloses an expander (20), a second separator (30), and a demethanizer (36) (see column 3, line 7 through column 4, line 58 and figure 1).

Lee et al discloses a pressure reduction device, a second separator (34), and a liquid (38a) that is employed as a lean demethanizer reflux and a vapor (44a) that is fed into the absorber (28a) (see figure 4, column 8, line 56 through column 9, line 3; and column 9, line 35 through column 10, line 14).

.Buck discloses a first separator (103), a turboexpander (106) that is configured to allow expansion of part of the vapor portion, and further comprising a second separator (107) that is configured to receive the expanded part of the vapor portion and to produce a liquid that is employed as a lean deethanizer reflux and a vapor that is fed into the separator (see figure 1 and column 3, line 43 through column 4, line 40).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to have a in the modified apparatus of Vijayaraghavan et al, because the addition of the absorber would be recommended when the feed gas contains heavier constituents, such as aromatic compounds, which could potentially freeze up in the reflux condenser at cryogenic temperatures as taught by Lee et al (see column 8, line 56 through column 9, line 3) as taught by Lee et al. and because such an

arrangement would result in improved separation of lighter components from the heavier components (see column 4, lines 13-26) as taught by Buck.

Regarding claim 15, the recitations with respect to ethane recovery and propane recovery are considered process limitations which do not impart further patentable weight to the apparatus claims.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554), Finn et al (US 6,363,744 B2), Buck (US 4,617,039), and Lee et al (US 6,354,105 B1) as applied to claim 9 above, and further in view of Hoffart et al (US 6,295,833 B1) and Campbell et al (US 5,771,712).

Regarding claim 11, Vijayaraghavan et al does not discloses a NGL plant wherein the first pressure reduction device comprises a hydraulic turbine, and wherein the second pressure reduction device comprises a Joule-Thomson valve.

However, Vijayaraghavan et al discloses a controlled expansion valve (24) as the first pressure reduction device (see figure 1 and column 4, line 59 through column 5, line 7) and an expander (20) as the second reduction device (see figure 1, lines 35-58).

Hoffart et al discloses that expander (56) may be an expansion valve, hydraulic turbine or other expansion device, or combination thereof (see column 5, lines 52-65).

Therefore, because these two expansion devices were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a hydraulic turbine for a controlled expansion valve.

Additionally, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a hydraulic turbine as the first pressure

reduction device, since it was known in the art that a hydraulic turbine is an expansion device (see MPEP 2144.03 (A-E)).

Campbell et al discloses an expansion valve (13) produced the Joule-Thomson effect during expansion (see column 54 through 9) such that the expansion valve is a Joule-Thomson valve.

Therefore, because these two expansion devices were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a Joule-Thomson valve for an expander.

Additionally, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a Joule-Thomson valve as the second pressure reduction device, since it was known in the art that a Joule-Thomson valve is an expansion device (see MPEP 2144.03 (A-E)).

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554), Finn et al (US 6,363,744 B2), Buck (US 4,617,039), and Lee et al (US 6,354,105 B1) as applied to claim 9 above, and further in view of admitted prior art.

Regarding claim 14, Vijayaraghavan et al does not disclose a NGL plant wherein the primary cooler employs as least one of external ethane, external propane, and the absorber overhead product as a refrigerant.

Lee et al discloses a cooler employs as least one of external ethane, external propane and another cooler employs the absorber overhead product as refrigerants (see figure 4).

The admitted prior art discloses that it is known to have a NGL plant wherein the primary cooler employs as least one of external ethane, external propane, and the absorber overhead product as a refrigerant (see figure 2 and page 2, lines 6-25).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Vijayaraghavan et al. with the teachings of Lee et al. and the admitted prior art such that the primary cooler employs as least one of external ethane, external propane, and the absorber overhead product as a refrigerant in order to enhance ethane and/pr propane recovery.

Response to Arguments

Applicant's arguments with respect to claims 1-7 and 9-20 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments, see Remarks, page 6, filed June 9, 2009, with respect to U.S.C. 112 rejection of claims 1, 9, and 16 have been fully considered and are persuasive. The 112 rejection of claims 1, 9, and 16 has been withdrawn.

Applicant's arguments, see Remarks, page 6, filed June 9, 2009, with respect to objection of claim 19 have been fully considered and are persuasive. The objection of claim 19 has been withdrawn.

Applicant's arguments filed June 9, 2009 have been fully considered but they are not persuasive.

The applicant disagrees with the examiner's assertion that the demethanizer would receive "...the absorber bottoms product as a lean reflux" because the stream

(94) in Lee's figure 4 is only used as a demethanizer reflux where that stream is directly routed and expanded to the demethanizer (see Remarks, page 7).

The examiner disagrees.

In figure 4 of Lee et al a line (94) from separator (34a) travels through the reflux exchanger (26) and optionally splits into lines (44, 44a), where line (44a) travel through a pressure reduction device (not labeled) into absorber (26a) where the bottoms travels through pump (150) through line (62B) into the demethanizer as lean reflux.

The applicant argues that the examiner fails to provide any specific details on how such modification of Vijayaraghavan et al with the teachings of Lee et al would be achieved without diminishing or entirely obviating Vijayaraghavan et al.

The examiner feels that she explained how Vijayaraghavan et al with Lee et al in the rejection of claim 1 explaining what each reference disclosed and did not disclose. The examiner felt the combined teachings met the limitations of claim 1.

The examiner disagrees that the teachings of Lee et al would diminish or entirely obviate the invention of Vijayaraghavan et al since both references disclose a demethanizer that operates under similar temperature and pressure and the vapor outlets of the separator enter the upper section of the demethanizer (see Vijayaraghavan et al figure 1 and column 4, lines 46-58 and Lee et al figure 4 and column 6, lines 42-55).

The applicant argues that duplication of a cooler is not obvious since the refrigeration content for the secondary cooler is provided by expansion of the liquid phase of the feed gas whereas refrigeration content for the primary cooler is provided

by external refrigerant and absorber overhead product.

Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATASHA YOUNG whose telephone number is 571-270-3163. The examiner can normally be reached on Mon-Thurs 7:30 am-6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer A. Leung/
Primary Examiner, Art Unit 1797

/N. Y./
Examiner, Art Unit 1797